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THE EFFECT OF WEATHERING ON THE MODULUS OF RUPTURE OF VHR2A AND--ETC(U)
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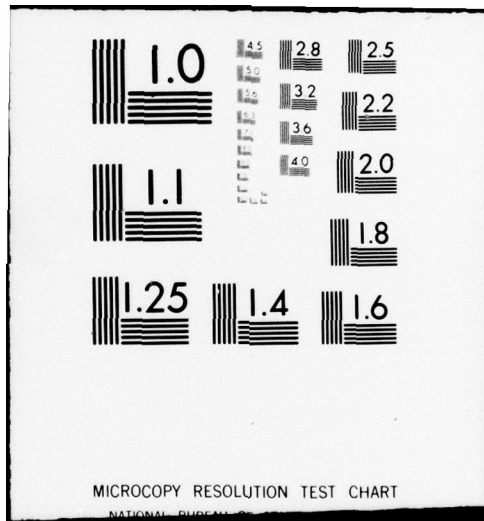
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DR Mat Report No 210

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THE EFFECT OF WEATHERING ON THE MODULUS OF RUPTURE OF VHR2A AND VHR3A GLASSES
(GLAVERBEL-MECANIVER SA)

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11 Sep 78

FOREWARD - Additional results are provided to those given earlier on the evaluation of these thin, high-strength glasses for aerospace applications. The programme was carried out by the British Glass Industry Research Association under MOD(PE) contract KS/1/0648/CB43A2. The work was under the direction of ADR Mat 2 and was monitored jointly by Mat R7, and ST3 Division of Structures Department RAE Farnborough.

The report contains no security classified information of overseas origin.

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SUMMARY

There appears to be no detrimental effect on the modulus of rupture of specimens of VHR2A and VHR3A glasses after they had been exposed either completely or partially for periods up to four years on the roof of the BGIRA building in Sheffield.

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1. INTRODUCTION

The evaluation of the VHR series of glasses offered by Glaverbel-Mecaniver SA has been described in an earlier report.¹⁾ The first results of a series of exposures aimed at investigating the effect of weathering upon these glasses were given in that report; the present report summarises all the results obtained over the 4 year period of exposure.

The research programme was carried out by the British Glass Industry Research Association under contract to the Procurement Executive, Ministry of Defence. Acknowledgement is made to Glaverbel-Mecaniver SA for the provision of specimens. Appreciation is expressed of the efforts of the staff of BGIRA, who have carried out the experimental work and have collaborated closely at all stages of the programme. Members of the staff of Structures Department RAE Farnborough have willingly advised and assisted in the work.

2. SCOPE OF THE WEATHERING PROGRAMME

Groups of beam specimens of VHR2A and VHR3A glasses were exposed in "protected" and "exposed" situations for periods up to 4 years. At previously agreed intervals certain groups were removed for measurement of the modulus of rupture.

3. EXPERIMENTAL PROGRAMME

As described in the previous reports beam specimens of nominal dimensions 254 x 38 x 2mm were exposed mounted on two wooden racks on the roof of the BGIRA building, one batch being completely exposed to the elements while the other batch was partially protected by a plastic roof from direct exposure to rain etc. During exposure the major edges of the specimens were at 45° to the horizontal and the minor edges horizontal. The upper faces of the beams faced due south.

After each weathering period had elapsed, the respective test groups of specimens were removed to the laboratory, where they were carefully washed in warm soapy water in order to remove grit and grime adhering to their surfaces. Sellotape was then applied to both sides of each specimen in order to retain the fragments after testing under four-point bending (outer span 203mm and inner span 76mm) at a stress rate of approximately 5 MPa s⁻¹. The modulus of rupture was determined from the fracture load as described earlier.

4. RESULTS

The modulus of rupture data are summarised in Tables 1 and 2 and graphically in Figures 1 and 2 for VHR2A and VHR3A specimens respectively.

All beam specimens failed from their edges under the bending test.

The results show that there was no apparent effect of weathering on the modulus of rupture of either of these glasses. The variations which occurred between groups were probably due to statistical fluctuations in sampling.

5. CONCLUSIONS

There appeared to be no detrimental effect on the modulus of rupture of specimens of VHR2A and VHR3A glasses after they had been exposed either

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completely or partially, for periods up to four years to weathering on the roof of the BGIRA building in Sheffield.

REFERENCES

1. The evaluation of VHR2A and VHR3A glasses (Glaverbel-Mecaniver SA) for aerospace applications.

N S CORNEY DR Mat Report No 198, (BR 44083), 1975

Weathered period	n	Mean MOR (MPa)	Range (MPa)	S.D. (MPa)	C.V.	95% C.L. (MPa)
3 months exposed	10	243	228-256	9.8	.040	7.2
3 months covered	10	247	230-270	12.7	.051	9.3
6 months exposed	10	246	228-258	10.1	.041	7.4
6 months covered	10	247	235-260	7.3	.030	5.3
1 year exposed	10	242	223-263	10.6	.044	7.7
1 year covered	10	241	226-254	10.2	.042	7.4
3 years exposed	9*	243	234-255	7.2	.030	5.5
3 years covered	10	252	232-268	11.6	.046	8.5

* One specimen cracked during removal from the weathering rack.

NB. All specimens failed from edges.

n - Number of specimens

SD - Standard deviation

CV - Coefficient of variation

CL - Confidence limit

TABLE 1 - SUMMARY OF FRACTURE TEST DATA FROM
WEATHERED VHR 2A LATHS

Weathered period	n	Mean MOR (MPa)	Range (MPa)	S.D. (MPa)	C.V.	95% C.L. (MPa)
3 months exposed	10	234	222-245	7.6	.033	5.5
3 months covered	10	232	213-250	11.3	.049	8.2
6 months exposed	10	228	222-244	6.0	.026	4.4
6 months covered	10	238	220-257	12.5	.053	9.1
1 year exposed	10	229	195-250	15.2	.066	11.1
1 year covered	10	227	218-237	6.1	.027	4.5
2 years exposed	10	235	213-247	10.0	.043	7.3
2 years covered	10	229	196-242	13.5	.059	9.8
3 years exposed	10	225	216-232	5.6	.025	4.1
3 years covered	9*	223	214-232	5.5	.025	4.2
4 years exposed	10	230	223-238	5.5	.024	4.0
4 years covered	9*	234	225-249	8.2	.035	6.3

* One specimen had cracked whilst in the weathering rack.

NB. All specimens failed from edges.

n - Number of specimens

SD - Standard deviation

CV - Coefficient of variation

CL - Confidence limit

TABLE 2 - SUMMARY OF FRACTURE TEST DATA FROM
WEATHERED VHR 3A LATHS

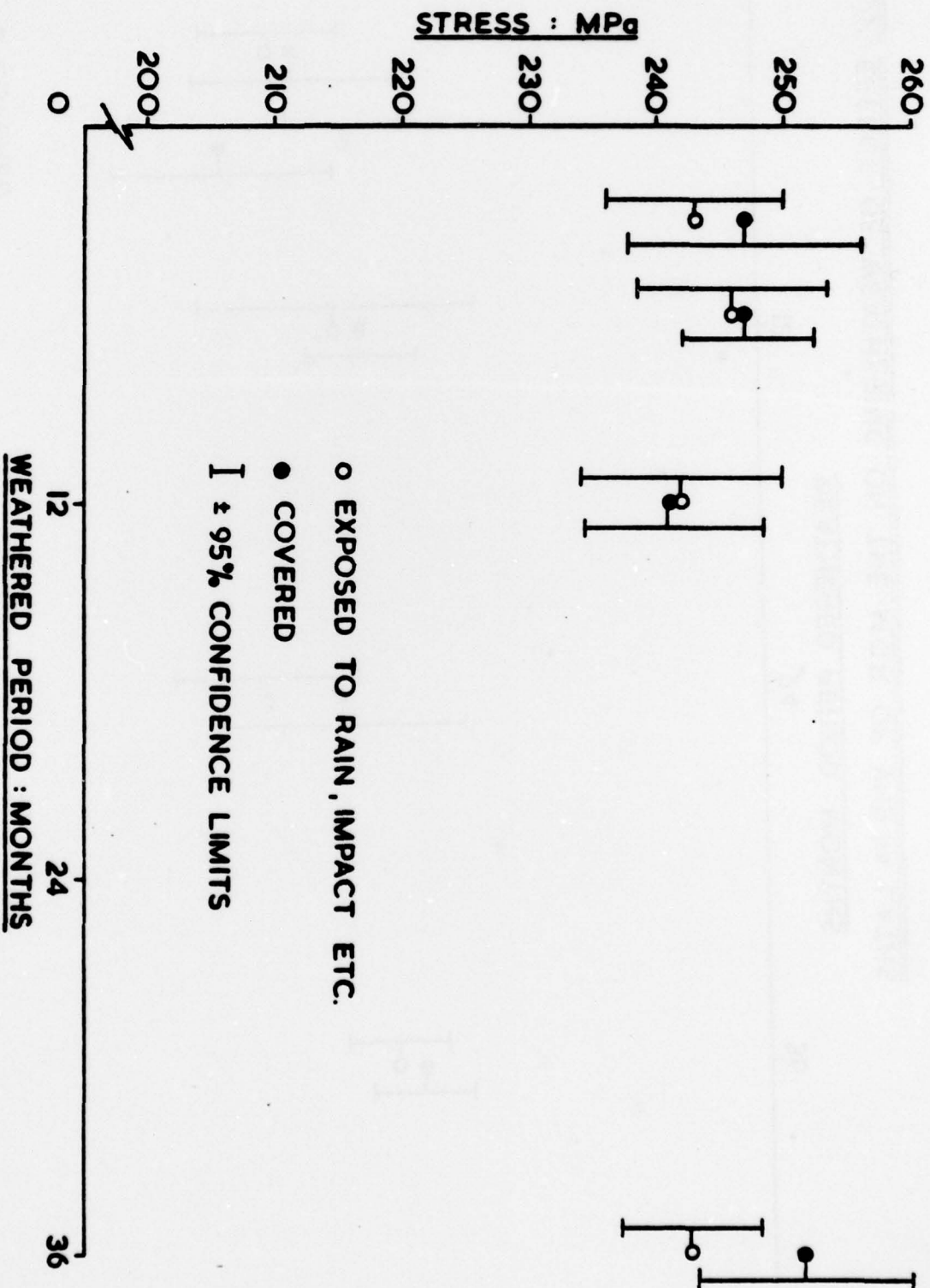


FIG. 1. EFFECT OF WEATHERING ON THE MOR OF VHR2A LATHS

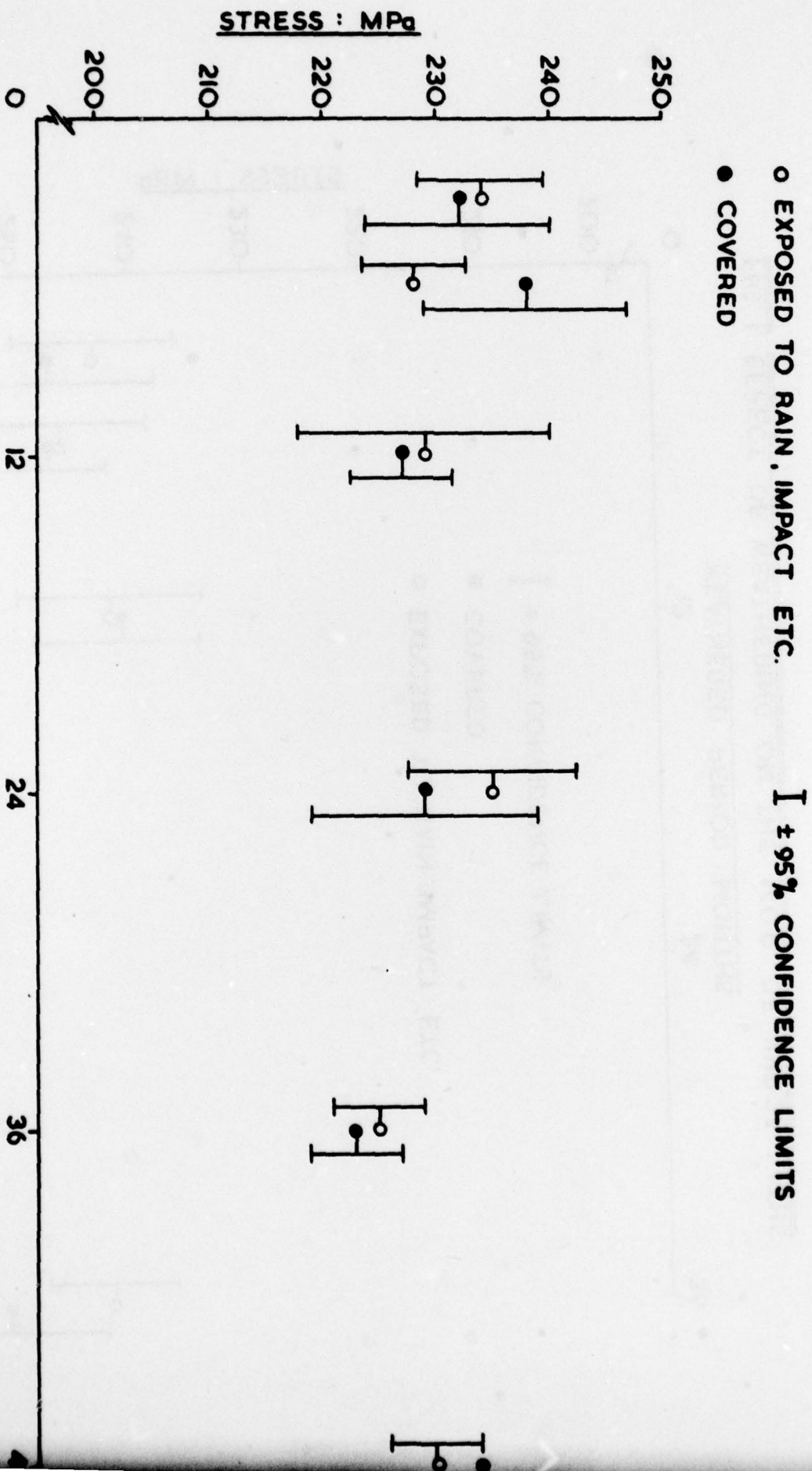


FIG. 2. EFFECT OF WEATHERING ON THE MOR OF VHR 3A LATHS

REPORT DOCUMENTATION PAGE

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